

REMARKS

Claims 1-3, 8-15, 18, 38, 40-45 and 50-53 are pending in the present application. In the Office Action dated December 3, 2003, the Examiner rejected claims 1-3, 8-15, 18, 38, 40-45 and 50-53 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner noted that an Examiner's Amendment was authorized by applicant's representative on August 14, 2002, in which the changes to correct the language in claims 1, 11, 38 and 42; this change was also notated in applicant's Amendment H, filed concurrently with an RCE on December 11, 2002. However, this change was not carried forward with the following amendment, filed on March 31, 2003 prior to a Notice of Allowance being issued. Applicant has corrected the claims to reflect the Examiner's Amendment. The Examiner additionally rejected claims 1-3, 9-13, 15, 18, 38 and 40-45 under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6, 294,040 to Raab et al. ("Raab"). The Examiner also rejected claims 8 and 14 under 35 U.S.C. 103(a) as being unpatentable over Raab as applied to claims 1-3 and 9-12, and further in view of U.S. Patent No. 6,169,328 to Mitchell et al. ("Mitchell"). Finally, the Examiner rejected claims 50-53 under 35 U.S.C. 103(a) as being unpatentable over Raab as applied to claims 1, 11, 38 and 42, and further in view of U.S. Patent No. 5,461,087 to Takahashi et al. ("Takahashi"). Applicant disagrees with these rejections and wishes to clarify various distinctions of applicant's invention over the cited art. Reconsideration of the invention is therefore requested in light of the following remarks.

In the remarks that follow, various technical differences between the references cited by the Examiner and the embodiments of the present invention are discussed. It is understood, however, that any discussion involving various embodiments of the invention, which are disclosed in detail in the applicant's specification, do not define the scope or interpretation of any of the claims. Moreover, any discussion of differences between the references cited and the various embodiments of the invention are intended only to help the Examiner to appreciate the importance of the claimed distinctions as they are discussed.

The various embodiments of the present invention are directed to a semiconductor package assembly having a plurality of pieces of a compliant adhesive film to adhere a ball grid array-type semiconductor die to an organic substrate or polyimide substrate interposer. The

compliant adhesive film reduces failures in semiconductor package solder bonds by reducing undesired shear stresses that may result from unmatched coefficients of thermal expansion for the interposer and the semiconductor die. A further advantage associated with the various embodiments of the invention is that the cumulative thermal expansion for multiple strips of adhesive film is less than the thermal expansion for a single layer of an elastomeric film. As a consequence, the stress on the ball grid array-package wire bond joints resulting from the different coefficients of thermal expansion between the die and the substrate are reduced.

In one particular embodiment, as described at page 8, lines 10-20, and further shown in Figure 2B of the present application, the compliant adhesive film may include one or more carrier layers having adhesive layers disposed on opposing exterior surfaces of the carrier layers. The carrier layers may be positioned mutually independently of one another, since there is no lateral coupling that extends between the strips of compliant adhesive film. The carrier layers thus described advantageously permit the adhesive material to be positioned on the carrier layers before the adhesive layers are presented to the die and the interposer.

The Examiner has cited the Raab reference as pertinent to the patentability of claims in the present application. In particular, the Examiner has cited the disclosure in Figures 1 and 14 of the Raab reference. With respect to Figure 1 of Raab, the Examiner urges a correspondence between the resilient pads 36 and the elongated strips as disclosed in the present application. The resilient pads 36 are not elongated strips. Instead, the resilient pads 36 are substantially axisymmetric bodies. The Examiner is referred to col. 10, lines 56-67 bridging to col. 11, lines 1 to 3, wherein it is disclosed that the resilient pads 36 are formed by applying a mass of a curable liquid to a stencil mask “...*having a plurality of holes extending therethrough.*” (Emphasis added). Applicant therefore respectfully disagrees with the Examiner’s asserted correspondence since Figure 1 does not disclose elongated strips.

With regard to the disclosure of strips of a compliant material as shown in Figure 14 of Raab, applicant notes that the resilient elongated strips 836 are mutually coupled by webs 856 that are used to properly mutually position the strips relative to another (col. 14, lines 27-29). Raab does not disclose or suggest that the elongated strips may be mutually independently positionable when interposed between the chip and the interposer.

The Examiner further cites the Mitchell reference for disclosing an external terminal comprising a solder ball. Applicant respectfully submits that the Mitchell reference fails to disclose the element missing from the Raab reference, namely, the use of elongated adhesive strips that are independently positionable when interposed between the chip and the interposer.

The Examiner further cites the Takahashi reference for disclosing multiple layers of a carrier material. Takahashi also does not provide the disclosure missing from the Raab reference, since no arrangement of the strips between an interposer and a chip is disclosed or suggested.

Turning now to the claims, patentable differences between the actual claim language and the applied references will be specifically pointed out. Claim 1, as amended, recites in pertinent part, “A semiconductor device package, comprising...a semiconductor die...at least one electrically conductive external terminal...an interposer...and...*a plurality of elongated strips of compliant adhesive film*, each strip having a first length and a second length perpendicular to the first length, the first length being substantially greater than the second length, the strips extending substantially the entire distance between the first pair of opposed lateral edges and disposed between the semiconductor die and the interposer, *each strip being mutually independently positionable...*” (Emphasis added). The Raab reference does not disclose or suggest this. Instead, Raab discloses compliant pads that are axisymmetric in shape. In another disclosed embodiment, Raab discloses elongated strips that are coupled by a web structure that extends between lateral sides of the compliant strips. Claim 1 is therefore allowable over the cited art. Claims depending from claim 1 are also patentable based upon the allowability of the base claim and further in view of the additional limitations recited in the dependent claims.

Claim 11, as amended, recites in pertinent part: “A device package assembly for a semiconductor die...comprising...laminating a plurality of strips of compliant adhesive film to an interposer...attaching to the interposer the semiconductor die having a first surface on which an integrated circuit and at least one electrically conductive bond pad are fabricated, the die having first and second pairs of lateral edges, *the strips of compliant adhesive film having a first length and a second length perpendicular to the first length, the first length being substantially*

greater than the second length, each strip being mutually independently positionable...” (Emphasis added). Again, the applied references simply do not disclose or suggest this. Accordingly, claim 11 is allowable over the cited art. Claims depending from claim 11 are also patentable based upon the allowability of the base claim and further in view of the additional limitations recited in the dependent claims.

Claim 38, as amended, recites in pertinent part, “A semiconductor device package, comprising...a semiconductor die...an interposer... and...*a plurality of elongated strips of compliant adhesive film*, each strip having a first length and a second length perpendicular to the first length, the first length being substantially greater than the second length, the strips extending substantially the entire distance between the first pair of opposed lateral edges between the die attach surface and the semiconductor die, *each strip being mutually independently positionable...*”. (Emphasis added). As presented in detail above, the applied references do not disclose this. Claim 38 is therefore allowable over the cited art. Claims depending from claim 38 are also patentable based upon the allowability of the base claim and further in view of the additional limitations recited in the dependent claims.

Finally, claim 42, as amended, recites in pertinent part: “A semiconductor device package, comprising...a semiconductor die...an interposer...and...*a plurality of elongated strips of compliant adhesive film*, each strip having a first length and a second length perpendicular to the first length, the first length being substantially greater than the second length, the strips extending substantially the entire distance between the first pair of opposed lateral edges between the die attach surface and the semiconductor die to adhere the carrier layer to the die attach surface of the interposer, *each strip being mutually independently positionable...*” (Emphasis added). Yet again, none of the applied references disclose or suggest this. Claim 42 is therefore allowable over the cited art. Claims depending from claim 42 are also patentable based upon the allowability of the base claim and further in view of the additional limitations recited in the dependent claims.

With respect to the Examiner’s rejections under 35 U.S.C. § 103(a), applicant respectfully submits that the above amendments, in avoiding the Raab reference also overcome the Examiner’s obviousness rejections. It is understood, however, that applicant does not agree with the Examiner’s rejections under 35 U.S.C. § 103(a).

With respect to the Examiner's rejections under 35 U.S.C. § 112, second paragraph, applicant has included the content of the Examiner's Amendment, which was agreed upon in a telephone conversation between the undersigned attorney and the Examiner on August 14, 2002. Accordingly, applicant respectfully submits that all rejections under 35 U.S.C. § 112, second paragraph, have now been fully addressed.

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a timely Notice of Allowance are earnestly solicited.

Respectfully submitted,

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Enclosures:

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